Government Size and Economic Growth in Iran

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Due to the importance of the government size impact on economic growth, the current study investigates the existence of Armey curve hypothesis in Iran economy as one of the most important hypotheses concerning the impact of government size on economic growth.The consumption expenditure of the government is defined as a percent of GDP representing an index of government size in this study. Based on the obtained results, the government size in Iranian economy affected the economic growth asymmetrically under a dual regime and its threshold has been determined as 14.29 for the government size. Results obtained from the study demonstrate that, in the first regime, the government size (the period in which the government size was less than 14.29), had a negative impact on the Iranian economy while the second one had a positive impact conversely. In other words, despite the support of nonlinear impact of government size on the Iranian economy growth, the results of hypothesis do not support the existence of Armey curve in in Iran.

Classification JEL: C22, H50,O40

Keywords: economic growth, government size, consumption expenditure, nonlinear model, STR model, Armey

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Introduction:

The relationship between government size and economic growth is one of the interests of economists and economic politicians. Based on the theoretical issues set forth by them, the government activities play a considerable role in states economic development and growth (in an economic system) and the increase of such activities has a positive impact on economic growth up to a certain threshold, passing which leads not only to a positive impact, but also works as main obstacles against growth. The theoretical determination of such nonlinear impact can be attributed to Ricahrd Armey. To determine the impact of such growth, he uses a curve, known as Armey, in economic literature. According to aforementioned curve, the government size affects the economic growth nonlinearly under the form of a quadratic equation. In other words, the relationship between these two variables is a reverse U.The hypothesis proposed by Armey have been used and examined in many empirical studies. It should be mentioned that thy have reported different results based on the type of statistical data and methods.The current study, in line with aforementioned methods, intends to investigate the hypothesis of existence of Armey curve in Iran using Smooth Transition Regression Model. The three fundamental characteristics of STR models cause further and more accurate investigation of them in comparison with conventional models. These characteristics are as following:

1- Changes in regimes or structural failures are determined by STR model endogenously. It is not required therefore to enter dummy variables in the model or investigate the structural failure independently.

2- In addition to having the capability of specifying the number and time of regime change, STR model demonstrates the speed of transition from one regime to another.

The current research has been organized in six parts. The first two parts mainly deal with theoretical fundamentals of the research and empirical studies respectively. Third part speaks about methodology and the fourth about data and the model applied for the study. In fifth part, we estimate the research model and analyze empirical findings. In the last part, we draw conclusion from what we have done.

2. Theoretical Fundamentals

The government expenditure, as one its major policy tools in economic growth theories, has drawn special attentions, especially for the endogenous growth theory to itself. Solo's neoclassical growth model (1956) and the Cass's theory of optimum growth, similar to Ramsay's, have considered a petty role for the government's expenditure in economic growth interactions. Based on such theories, long-term or endogenous economic growth is equal zero and the government's decisions are ineffective in long term. Generally, neoclassical growth patterns are considered as capitalistic economic growth theories. These theories attribute economic growth to accumulation of tangible capital and exogenous technical advances. They claim that lesser rate of population increase and higher level of technology increase the short-term growth rate. Therefore, the government's decisions cannot have positive impact on balanced short-term level of major economic variables such as short-term balanced growth.

In the mid-1980's, some theoreticians, under the leadership of Roamer, levelled some criticisms at the exogenous growth models. In which, growth ineffective factors were determined endogenously. The theory produced a positive wave in such a way that further studies set forth the question of whether the government's decisions may affect the economic growth?. The empirical studies reported different results. For instance, Ram (1986), Aschaver (1989), Mionell (1992), Esterlli and Reblow (1993), Gramlich (1994)

have reported the positive impact of the government's expenditure on economic growth, while Landav (1986), Garrier and Talvec (1989) and Karras (1994) have reported the negative impact of the government's expenditure on economic growth. Levin and Renlet (1992),Holtz Ikin (1994), Sterm and Dihan (1995), Esolmerd (1995) and Egel et al. have not reported a considerable and meaningful impact.

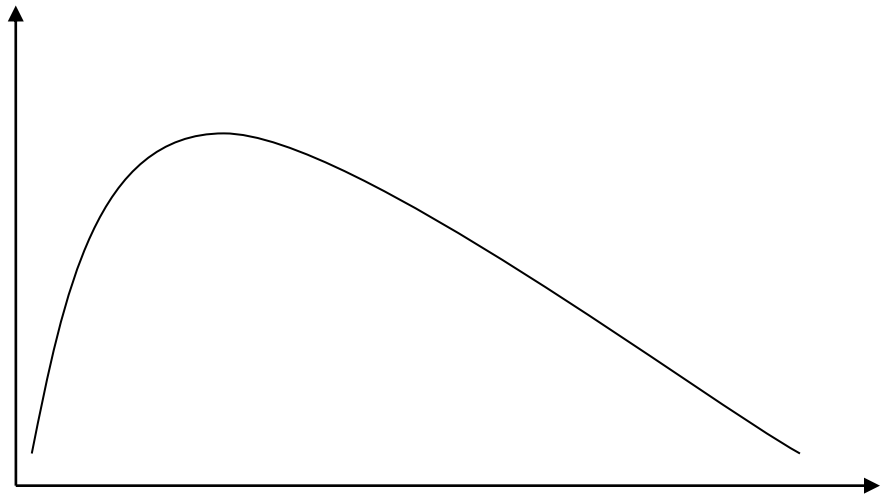
Baro (1990) emphasized the positive correlation between government expenditure and economic growth by setting forth productive government expenditure. The theory is a saddle for the productive importance of government expenditure in economy. The productive viewpoint of government expenditure is an optimum point for its expenses. In other words, it expresses that when the government has control over a major part of the economy, the investments opportunities are restricted and produce a vast negative impact on productivity. In addition, general nonproductive expenses are considered as major impediments against economic growth. The following equation demonstrates the set forth issue:

Eq. 1: $GEt = PEt + UEt$

Where, GEt is the total expenses of the government in t period, PEt is the productive part of the government expenses such as ineffective investments in man power, infrastructures and legislations, UEt: is the nonproductive part of the government, such as bureaucracy, monetary corruptions, effective planning etc. On this ground, the government expenditure is at optimum state when $UEt= 0$.

Development of the government optimum size can be attributed to Richard Armey(1995). According to his opinion, when a government is small from the viewpoint of economy, development of government size leads to increase of production and economic growth. Conversely, when the government is big, its size leads to decrease of economic growth. An economy lacks the support of government, lawlessness, nonsupport of property rights and shortage of infrastructures leads to low productivity and welfare in society. In contrast, the one fully supported by government (all decisions made by it), the production is low in that. In general, in an economy with amalgamation of the both foregoing procedures (privately and governmentally supported), production is high.

The Armey curve drawn in diagram 1 demonstrates that if other conditions are constant, the unfavorable impact of continuous growth of government size culminate in effacement of the positive impact of the gov't expenditure on economic growth due to occurrence of descending productivity law. Although the gov't expenditures have positive impact on economic growth prior to the curve maximum point, the more the curve approaches maximum point, the more the intensity of such ineffectiveness decreases. In addition, not only gov't expenditures leads to economic growth after maximum point, but also it leads to decrease of economic growth (Lizardo, Molik, 2009). Of the reasons, government loans and tax increases can be instanced. These reasons may cause the lack of motivation for businesses and decrease of economic growth (Woder, Galloway, 1998).



Empirical Studies:

Many researches have analyzed the relationship between the government size and economic growth in Iran and many other countries. Some of them have reported different results based on the research assumption, period of the times the study conducted, the model variables and the country of study. Some of them have been analyzed in this study based on time, the given country and technics. The results of which have been mentioned in Table 1.

Researcher(s)	**Time period and the country(ies) of study**	**Technic**	**Results**
Landuae (1986)	104 less developed countries (1961-1967)	Panel Data	The meaningful and negative relationship between the share of in government expenses in real GDP and real per capita GDP rate
Grier and Tul (1989)	113 countries Ghana (1963-1984)	Panel Data	The meaningful and negative impact of the gov't expenses on the economic growth of the given country
Karikari (1995	Ghana (1963-1984)	2SLS	Existence of meaningful and negative relationship between

			economic growth and gov't expenditures
Devarajan (1996)	43 countries (1970-1990)	Panel Data	Negative (positive) impact of current expenditure of the government on economic growth
Knoop (1999)	USA (1970-1995)	OLS and time series analyses	Negative impact of the government size decrease on economic growth and welfare
Albatel (2000)	Saudi Arabia (1964-1995)	Accumulation technic	The positive impact of government expenditure on economic growth
Folster and Henrekson (2001)	Countries with high incomes (1970-1995)	Panel Data	Existence of strong relationship between government size and economic growth
Abu-Bader and Abu-Qarn (2003)	Egypt and Syria (1973-1998)	Accumulation and variance analysis	The negative impact of government expenditures on economic growth of countries
Chen and Lee (2005)	Taiwan (1979-2003)	OLS	Existence of nonlinear relationship between government size and economic growth and support of Armey curve in Taiwan
Wing Yuk (2005	England (1830-1993_	Accumulation Technic	Absence of long term relationship between the government size and economic growth
Gupta et al (2005)	39 developing countries	Panel Data	The negative impact of the government's current expenditures and the positive impact of the capital expenditures of government

			on economic growth
Alexious (2007)	Greece (1970-2001)	OLS Technic	The positive impact of the Greek government's expenditures on economic growth
Ghosh and Gregoriou (2008)	15 developing countries	Panel Data	Existence of positive relationship between economic growth and the capital expenditures of the government and the negative relationship between economic growth and the current expenditures of government
Roy (2009)	USA (1950-1998)	Simultaneous equations	Negative impact of the government size decrease on the US economic growth
Hakro (2009)	Asian developing countries (1981-2005)	Panel Data	The positive impact of government's expenditures on economic growth
Lizardo and Mollik (2009)	23 Latin American Countries (1974-2003)	Panel Data	The negative impact of government's expenditures on economic growth

Resource: the research results

Research Methodology:

A standard STR model with Logistic transition function as introduced by Trasorta (2004) is as following:

$$y_t = \varphi' z_t + (\theta' z_t).G(\gamma, c, s_t) + u_t$$

$$G(\gamma, c, s_t) = \left(1 + \exp\left\{-\gamma \prod_{k=1}^{K} (s_t - c_k)\right\}\right)^{-1} \quad , \quad \gamma > 0$$

Where is the vector of linear parameters and $\theta=(\theta_0,\theta_1,...,\theta p)$, the vector of nonlinear parameters. Zt is the vector of exogenous variables of the model, includes some pauses of exogenous and endogenous variables. ut is the error of this equation, supposedly provide the required condition of

$u_t \approx \text{iid}(0,\sigma^2)$. In addition, G is a continuous and bounded logistic function ranging between 0-1 and indicates the smooth transition in regimes. S is indicative of transition , γ is the transition speed parameter and c, the threshold of regime change. In the STR model discussed by Van Dick et al (2000) and Lin and Trasoorta (1994), s transition variable may be exogenous and/or endogenous pauses of time trend, the exogenous variable itself, or a function of endogenous and exogenous variables. K parameter demonstrates the iteration of regime changes.

It should be mentioned that the quadratic equations used in other studies is merely a special condition of LSTR and is a part of which. Accordingly, if LSTR model is rounded using Taylor expansion around $\gamma = 0$ from the first instance, the following equation is yielded:

Eq. 3: $pt = \varphi 0 + (\varphi + \theta\beta 1)yt + (\theta\theta 2)y + \theta y R + u_t$

This equation is clearly indicative of a quadratic equation.

To estimate LSTR models, the nonlinear relationship between variables should firstly be tested. If such relationship proved to be present, the number of required amounts for fitting of the variables in assessment and transition variable should be determined. The next step is to estimate the maximum likelihood of the model using appropriate primary amounts and Newton-Raphson Algorithm according to the nature and nonlinearity of the model. Finally, when the model and parameters are estimated, graphical analyses, along with some tests such as absence of autocorrelation errors, the permanency of parameters in different regimes, absence of residual nonlinear relationship, permanency of parameters in different regimes, ARCH-LM and Jarque-Bera test, should be used to verify the accuracy of estimations.

5- Model:

The following pattern of econometrics has been used to assess the hypothesis of Armey curve existence in Iran:
$EGt = \varphi'\omega t + (\theta'\omega t).G(\gamma.c,st)+ut$
Where:

EG : (is) the GDP growth rate for the fixed prices 1997 CG: the government size

ωt: a vector of GC variable and paused amounts of this variable along with with paused variables of EG

$\varphi'=(\varphi_0,\varphi 1,..., \varphi p)$: is the vector of linear part coefficients

$\theta'=(\theta_0,\theta_1,..., \theta p)$: is the vector of nonlinear part coefficients
γ: transition speed from one regime to another
C: threshold

G: transition function
ut :the error of equation

6- The model estimation and findings analyses:

The first step to estimate a STR model is to determine the optimum pauses for the variables used in the model. They have been determined as 2 and 6 respectively based on Akaike criterion of optimum pause for EG and GC variables.

Upon determination of the optimum pause of the model variables, the next step of STR model estimation is the test of verifying the existence of nonlinear relationship between variables. If (the existence of) such relationship is approved, appropriate transition variable and the number of regime changes must be determined in a nonlinear model based on the statistic of F tests.

Table 2 demonstrates the results of this level of research. Zero hypothesis of F test, which is based on the linearity of the model (except the time the first and second pauses of economic growth after pause of government size are selected as transition variable) is refused. However, it must be taken into account that a variable must be selected as transition variable, which holds the biggest F statistic among all variables. In other words, a transition variable must be priority which its zero hypothesis of F test is

refused strongly. According to the results reported in table 2, the pause 6 of government size variable is ascribed as the most appropriate transition variable.

The appropriate pattern for transition variable GC (T-6) is the smooth transition regression model with bi-regime logistic transition function with one transition (LSTR 1).[1]

Table 2_ selection of the transition variable and type of model

Proposed model	**The value of probability F statistic**	**Transition variable**
Linear	0.05	EG(t-1)
Linear	0.16	EG(t-2)
LSTR 2	0.01	GC (2)
LSTR 1	0.03	CG (t-1)
LSTR 1	0.02	CG (t-2)
Linear	0.46	CG (t-3)
LSTR 1	0.01	CG (t-4)
LSTR 1	0.02	CG (t-5)
LSTR 1	0.00	CG (t-6)

Source: research results

Table 3 shows the results of estimation of model parameters with the use of Newton-Raphson Algorithm.

Table 3: results of model estimation

Variable	Coefficients of linear part	Coefficients of nonlinear part
CONST	-	-21.95 -1.55
EG(t-1)	-0.18 -1.35	**-0.55 -2.24
EG(t-2)	***-0.34 -2.90	-0.23 -0.99
GC (t)	***-1.09 -2.45 -0.62	**1.90 2.32 2.05
CG (t-2)	-1.26 0.65	2.100
CG (t-3)	1.49 ***-1.56	-1.74 -1.95
CG (t-5)	-3.38	***2.41 2.93
CG (t-6)	*1.50 1.72	**-2.60 -2.27
R^2 Adjusted= 62.58%	SBC= 3.06	AIC= 2.83

*** meaningfulness in 99% level, ** meaningfulness in 95% level, * meaningfulness in 90% level Numbers in parenthesis demonstrates t statistic value for estimation of coefficients.

1- When the hypothesis of linearity of variables relationship is refused, following tests are carried out on standard STR model with logistic transition function:

$H03 : \beta 3 = 0$

$H03 : \beta 2 = 0\ \beta 3 = 0$

$H02 : \beta 1 = 0\ \beta 2 = \beta 3 = 0$

Statistic of those tests, which are related to zero hypothesis, is respectively shown as F2, F3 and F4. IF H03 hypothesis is refused, LSTR 2 model or LSTR is approved and one of them can be selected by testing zero hypothesis c1=c2. If H04 and H02 are refused, LSTR1 is selected. Because the value of F2, F3 and F4 probabilities have been estimated as 0.01, 0.24 and 0.00 for GC (t-6) transition variable, the appropriate proposed pattern for transition variable GC (t-6), smooth transition regression model with logistic transition model with two regime have been determined with one transition .

Final estimated values for uniformity is 7.15 □ and 14.29 of GDP for the threshold government size. Therefore, transition function is as following:

$$G(7.15,14.29,GCt-6) = (1+(\exp\{-7.15(GCt-6-14.29)\})^{-1}$$

Moreover, based on the results reported in table three and in accordance with the fact that G= 0 in the first regime and G=1 in the second one, the following equation can be written for the first regime:

$$EGt = 15.68 - 0.18EGt-1 - 0.34EGt-2 - 1.09GCt - 0.62GCt-2 + 0.65GCt-3 - 1.56GCt-5 + 1.50GCt-6$$

The following equation can be written for the second regime:

$$EGt = -6.27 - 0/73EGt-1 - 0/57EGt-2 + 0/81GCt + 1.43GCt-2 - 1.09GCt-3 + 0.85GCt-5 - 1.10GCt-6$$

The summation of the government's size coefficients in the first regime is equal with -1.12 and 0.90 for the second one. It means that the government size, in the first regime, has a negative impact while the second one has a positive impact on economic growth during the study period in Iran. Therefore, it can be concluded (from the results) that although the government size in different regimes has impacted asymmetrically (and with different impacting coefficients) the Iranian economy growth and while the government size had a negative impact on economic growth in the first regime (and a positive impact in the second one), the hypothesis of Armey curve cannot be accepted for Iran. In other words, in contrast with Armey hypothesis, the relationship between the government size and Iranian economy growth is in the form of U.

Diagram 2 demonstrates the period related to first and second regimes in accordance with threshold amount of 14.29 of the government size. As depicted in diagram 3, most post-1996 quarters belongs to the first regime, while most pre- 1996 quarters belongs to the second regime.

A fundamental question here comes into mind. Why the results have not approved the existence of Armey curve in Iran?[2] To reply, type of conditions governing the government's expenditures should be considered in analyses of Armey curve. Theoretical literature have emphasized that the government consumption expenditures have negative impact on economic growth due to shortage of the society resources such as skilled manpower, raw materials and credits. This is due to the fact that when a government allocates production factors, such as capital and manpower, a pressure would be exerted on production (private) agents and production expenses would rise in private sector. Therefore, the motivation for doing so would be declinws as a result (Green and Villanova). This issue has been proved in many empirical studies conducted by Landao (1983), Cormandy and Migoer (1985), Baro (1991), Engen and Skiz (1992), Lizardo and Molik (2009) and Kazerooni and Ebghaei (2007).Seemingly, negative

impact of government consumption expenditures is not far expected in the first regime and economic conditions of Iran as a share of GDP. But the question here comes into mind is that why the

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2- It should be mentioned existence of Armey curve in empirical studies literature have not always be proved. Studies carried out by Gmarnet et al, 1998, Vedder and Galleway, 1998, Lin, 1994, Hsieh and Lai, 1994 can be pointed out for example. It seems that the results depends on the country and and type of the standings considered in the study.

negative impacts have not been observed in higher levels of expenditures (second regime)? To reply, it should be mentioned that according to periods assessments of these two regimes, the second one includes quarters before 1996. It can be argued that this positive but temporary impact does not spring from the said period. It seems that such expenses have played the role of a market for production and investment sector in Iran in line with policies of the fifth and sixth governments, i.e. prioritization of reconstruction of war-torn area, economic development, adjustment policy and export development (instead of import)

The test deals with un-remaining of nonlinear relationship in the model residues. According to the value of F test statistic probability (estimated as 0.15), the zero hypothesis, which is based on the absence of the extra nonlinear relationship in an appropriate reliance level is refused. Therefore, the model has generally been specified and nonlinear relationship between variables has been proved.

Another test deals with permanency of parameters in different regimes. The value of F statistic of tests has been estimated as 0.02. Based on which, the zero hypothesis of that express the uniformity of coefficients in linear and nonlinear parts and 95% probability level is refused.

ARCH-L-M and Jarque-Bera tests can be instanced as other tests assessing probable errors in estimation level for STR model. These tests respectively investigate the errors of variances incongruity and abnormality of residues. Based on ARCH-LM test, the value of F and $\chi 2$ statistics probability has been estimated as 0.95 and 0.96 respectively. Based on the value of these statistics probability, zero hypothesis of the test which is based on the absence of variance in congruency (that is contingent upon autoregression) is not refused in an appropriate level of reliance. In the meantime, the value of $\chi 2$ statistic probability of Jarque-Bera been estimated as 0.89. Based on which, the zero hypothesis that is based on normalness of residues cannot be refused. In abbreviation, based on the tests of model appraisal, and nonlinear steam aided model is evaluated acceptable from the viewpoint of quality.

7. Conclusion:

In this study the hypothesis for existence of Armey model has been assessed using the quarterly data of the period 1988- 2008 and based on STR method. Results of this study approve the nonlinear impact of government size on economic growth during the said period. The threshold amount for the Iranian government size has been determined as 14.29% of GDP. The sum of government size coefficients and its pauses during the first and second regimes have been estimated as – 1.12 and 0.90. Based on these sums, it can be deduced that the government size had negative impact on the economic growth in the first regime and positive impact in the second regime. Despite the approval of

asymmetrical impact of government size on economic growth (due to a negative impact of government size and economic growth in the first regime) and positive impact of government size on economic growth in second regimes (respectively in lower and higher than 14.29), no evidence approving the acceptance of Armey curve existence has not been observed in Ian. As a matter of fact, absence of Armey curve is approved for Iran.

Another point which has to be taken into account is that the current study has taken the use of GDP growth in Iran which includes oil –related incomes. Therefore, when these incomes decrease, both GDP and government size decreases accordingly. The issue manifests as a positive relationship between these two variables. Therefore, it is recommended to conduct this study without considering oil-related production growth rate.

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